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ABSTRACT

A 1-year postdoctoral research training program prepared one trainee in early childhood education during 1966-67. Flexible arrangements allowed this mature trainee to plan and follow his own program in consultation with the staff of the Research and Development Center in Educational Stimulation at the University of Georgia. Experimentation in ongoing school programs enabled the trainee to develop an inventory of early mathematics accomplishments for 5-year-olds, which was then used systematically by him in New York State as well as by others in Follow Through programs. Development of this group test of mathematics achievement is described, including the specification of detailed administrative procedures necessary with young children. The postdoctoral research training program was judged effective for its purpose, following the original proposal to provide a high level professional apprenticeship. Suggestions are made for improvement of the USOE research training program by expanding its scope to include establishment and support of advanced training centers to meet current retooling demands for high level educational personnel. (Author/DP)

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Final Report

Project No. 6-1881

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Postdoctoral Research Training Program in Educational Stimulation

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February 27, 1969

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Introduction

This Postdoctoral Research Training Program in Educational Stimulation was designed to help individuals needing to supplement doctoral training and experience in a related field with specialized research training in early childhood education. The plan was to meet a need for people who had backgrounds of doctoral training and experience in elementary education, curriculum development, educational psychology, or a subject matter field of teaching for substantial upgrading in a new specialization, early childhood education, for which training had been taken by few in the past but for which there was a new great demand. It was to be highly individualized and linked closely with research training available in connection with operation of the University of Georgia Research and Development Center in Educational Stimulation (Ages 3-12). As finally approved, one trainee was allocated to this program officially for the period from May 24, 1966 to August 31, 1967. The trainee who was recruited, Dr. Anthony N. Schwartz, was already committed for Summer School 1966 for other projects, so by agreement of all concerned he reported in late August 1966 and accomplished the bulk of his training and research within the 1966-67 school year, leaving at the end of June 1967.

Description of the Program

Because only one trainee was allocated for 1966-67, and he was the mature director of a laboratory school in elementary education at SUNY at Plattsburgh, New York, Dr. Schwartz was given freedom to chart his own course with what help he felt he needed from Dr. Warren G. Findley, Director of the Research and Development Center in Educational Stimulation, Dr. Charles E. Johnson, Associate Director for Program Development and Field Testing, and Dr. Harry E. Anderson, Jr., Associate Director for Evaluation.

The plan developed by Dr. Schwartz and approved by his advisors may be said to have been as follows:

1. Exploration of the field of early education by consulting, reading, and visiting.

2. Identification of a problem area.

3. Survey of needed research tools.

4. Mastery of needed research techniques under guidance.

5. Carrying out of a school investigation, including development of testing instrument.

Dr. Schwartz began by consulting separately the three staff members already mentioned. Under the guidance of Dr. Johnson, he visited the five active field centers of the R & D Center located in Clayton, Oconee

and Oglethorpe counties, and in the cities of Gainesville, and Athens, Georgia, as well as several private kindergartens in Athens and Atlanta, including the Montessori Schools in Atlanta. He also read widely in the works of Piaget, Bruner, Taba, and others, especially the replications and extensions of Piaget's approach to young children's mathematical development. These latter works gave conflicting evidence regarding stages and sequences.

Dr. Schwartz decided quite early in October 1966 that his own interests and the needs of the field converged at the point of developing a test, or inventory, of early mathematics accomplishments of children aged 3 to 5. He found diverse approaches to early mathematics education being tried at the several field centers, for which he and his advisors agreed a common inventory could provide useful absolute and comparative evidence. In the preprimary program for children 3 to 5 at Suder School in Clayton County, the children were being offered experience with Piagetian tasks in conservation of length and one-to-one correspondence; at Gainesville, culturally deprived five-year-olds were being introduced to mathematics via a simplified variation of the Addison-Wesley mathematics series for primary grades, as was also the case at the centers in Oconee and Oglethorpe counties; at Athens a specially developed "creative-esthetic approach to reading and number readiness and beginning reading and mathematical skills" was being tried with five-year-olds. All the children in all five situations were being "instructed" in mathematics for the first time in a school situation.

Thus, a benchmark was needed. "Tests" at this level were not available and a survey of standardized tests in mathematics for primary grades gave only minimum guidance. The emphasis in evaluation at this age was on individual testing and behavior observation.

Dr. Schwartz set out to fill the need for a mathematics instrument administrable to groups. He was guided by the statements of "target learnings," behaviorally stated objectives for an average child by age 6 who had enjoyed three years of preprimary instruction, that had been developed at a workshop the preceding summer by teachers at the Suder School in Clayton County under the direction of Dr. Johnson; by the content of the Addison-Wesley materials adapted for use with the culturally deprived five-year-olds at Gainesville; and by the content of the primary level arithmetic tests previously mentioned.

Dr. Schwartz first pilot-tested a small number of test exercises with the youngest and most deprived children to establish a response format in collaboration with Dr. Johnson and the teachers in the field centers. He quickly confirmed the judgment of staff members from their earlier experiences that in all his testing he would need to present only a single item to a page to minimize distraction. Moreover, each test would require a warm-up exercise to give the children practice in responding. Special simplified procedures for marking choices were devised. He then undertook to build what became an 81-item first edition of the Schwartz Early Mathematics Inventory* (SEMI), involving the following categories and number of exercises:

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* Sample enclosed with first copy.

			Items
I.	Problem Solving		15
	A. If-then number story situations	8	
	B. Reproduction of quantities	7	
II.	Visual Discrimination		19
	A. Matching and analyzing shapes	6	
	B. Recognition of sub-sets	6	
	C. Analyzing patterns of classification	7	
III.	Comparisons		14
	A. Semi-concrete non-equivalent sets	5	
	B. Abstract non-equivalent sets	6	
	C. Ordinality	3	
IV.	Geometric Identification		5
V.	Spatial Judgment		6
VI.	Time Identification		3
VII.	Numeral-Number Concepts		11
VIII.	Money Identification		4
IX.	Fractional Recognition		4
	Total		81

This first form was administered to all five-year-olds in four of the field centers and one private kindergarten in January - February 1967.

Concurrently Dr. Schwartz turned to Professor Findley for special assistance in test planning and item writing and obtained individual help from Professors Anderson and W. L. Bashaw on computer programing with particular reference to TSSA1, a program for item analysis of tests developed by Klopfer and Wolf at the University of Chicago. Dr. Schwartz applied the TSSA analysis technique to eliminate ambiguous and inefficient items. After further consultation with Professors Findley, Anderson, and Bashaw, Dr. Schwartz prepared a paper summarizing his development of the SEMI entitled, "The Assessment of Representative Selected Mathematical Concepts of Five Year Old Children." This paper, slightly edited, has been accepted for publication in 1969 in the Journal of Experimental Education. (See Appendix A)

Dr. Schwartz readministered the same edition of the Schwartz Early Mathematics Inventory in April - May 1967 to the five-year-old children in the same field centers. Again the responses were subjected to the TSSA computer program. The results of the factor analysis portion of the program were compared with results from the factor analysis data from the earlier administration and with the logical formulation of the items. Professors Findley, Anderson and Bashaw again served as consultants.

Dr. Schwartz gave rigorous attention to the relations present, but it seems only fair to say that he and his advisors learned as much about the limitations of factor analysis technique applied to item data as about the fundamental structure of the test. It was decided to retain the factor analysis data for reference in further development of the test. Subsequent refinement of the test has made it useful in the continuing program with culturally deprived five-year-olds in the Gainesville schools under the direction of Dr. Alexander F. Perrodin, assisted by Dr. Mary R. Larsen. A 64-item measure* with "norms" from the first and second administrations serves the benchmark function for which the test development was originally intended. The test is available for use not only in the Research and Development Center, but in Head Start and Follow Through programs. Dr. Schwartz is using the revised edition in Head Start and Follow Through programs in New York State where he renders consulting service. The test is also available in Follow Through programs stemming from the Research and Development Center in Educational Stimulation.

Evaluation of the Program

1. It is not often true that one can say this, but the best short summary evaluation would be to say that we lived up virtually to the letter to the "Summary of training proposal" on the front page of the original application and are satisfied that it worked out as expected. That statement is reproduced below and reads as follows:

" Trainees will bring themselves up to date by guided reading in early childhood education in the areas of research studies, research design, evaluation technique, computer programing, curriculum innovation, school organization and staffing, learning theory, child development, urban and rural sociology, and compensatory intervention for disadvantaged children. Each trainee will be assigned to the director or one of the associate directors of the Research and Development Center in Educational Stimulation, who will guide his reading and supervise his participation in ongoing research or field testing in the schools of nearby districts. It is expected that each trainee will produce a substantial, publishable monograph or the equivalent in several shorter ones. In exceptional cases, it may be possible to meet the postdoctoral student's needs by scheduling him into regular advanced graduate courses for some of his work, but it is expected that guided reading, direct observation, and participation as a staff member in conducting research, developing curriculum materials, field testing innovative procedures and/or materials, or the development of evaluative technique will add most to predoctoral training."

To summarize further under the separate headings:

a. The objectives of upgrading otherwise well-trained and experienced personnel in the newly important field of early childhood education has become accepted nationally, as witness the founding of a special

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* Sample enclosed with the first copy.

PS 002769

National Laboratory Program on Early Childhood Education by the U.S. Office of Education where research training is available.

b. The availability of the Research and Development Center in Educational Stimulation (ages 3-12) with its longitudinal study of the effects of early schooling and its experimentation with curriculum development for young children still gives a natural focus to the retooling of mature specialists to deal with research and development in early childhood education.

c. Added staff in developmental psychology and child development give additional sources of consultation and guidance. General increase in staff each year means 80% more staff in the College of Education, over 50% more university wide by 1968-69.

d. Postdoctoral research training is available on a national competitive basis through the U.S. Office of Education, so selection criteria operate primarily at that level. In this particular Postdoctoral Research Training Program in Educational Stimulation the selection criteria would remain the same. We would continue to use evidence of prior research productivity beyond the doctorate as a prime consideration, with relevance of prior specialization to early childhood education and evidence of interest and opportunity to apply research training experience also highly important. Letters of recommendation on this point would affect final decisions. A University of Georgia program of postdoctoral research grants is now in effect, permitting the above criteria to be applied to candidates for this program who do not succeed in the national competition, but compare favorably with other candidates for local stepends averaging $7,500 for an academic year.

e. Organization would stand. Its flexibility is ideal for the students. Postdoctoral trainees are mature and we were able to treat our trainee accordingly.

f. Budget arrangements proved satisfactory. Keying the grant to the trainee's current salary presented us with a problem of relating the amount granted to the trainee's total income while on sabbatical. It would appear well to use current salary as the basic criterion, but not subtract sabbatical benefits, on the grounds that such benefits have already been earned from the employing institution. Increasing the institutional allowance to $3000-$5000 per trainee would justify greater allocation of specific staff to the trainee under workload arrangements. Addition of $2,000 per trainee in this program for travel would permit guided visiting of early childhood education centers exhibiting special approaches. There is no substitute for on-the-spot visitation of centers unless and until a center like the National Coordinating Center of the National Laboratory in Early Childhood Education can assemble a program based on conferences and videotapes of teaching.

2. The unique strength of the program was the flexibility of study arrangements. Dr. Schwartz had access to a wide variety of people under the minimum guidance appropriate to a mature specialist. In the continuing programs at the University of Georgia we would operate the same way, taking advantage of added specialists like Charles Smock in developmental psychology, Keith Osborne in child development, and Paul Torrance in educational psychology, to name only a few, for consultation and guidance of trainees. Another unique value is the ongoing research of the Research and Development Center in Educational Stimulation, especially its longitudinal study in a natural school setting to ascertain the persistent effects of sending a cross-section of the population to school at age 3.

3. The major weakness is the absence of efficiently developed training materials and procedures, which we share with all programs seeking to provide postdoctoral research training in early childhood education. In 1966-67, staff with background experience at this level was limited, but recruiting has greatly improved this. Experience in conducting early schooling and in training teachers for Project Follow Through with materials developed in the Research and Development Center will help meet these deficiencies. This experience includes use of videotapes and other educational technology to simulate live observation. There were no administrative hang-ups with our own administration or USOE.

4. The program was generally efficient and effective. Our single trainee has returned to New York State where his services are in considerable demand in the evaluation of Head Start and Follow Through projects. With that state rapidly moving toward public school programs beginning at age 4, Dr. Schwartz has put himself in an excellent position to help conduct research and evaluation studies in a major ongoing school program. As indicated earlier in this report, the test he developed, the Schwartz Early Mathematics Inventory, has been used systematically in connection with continuing study of five-year-olds in Gainesville, Georgia, and in the Follow Through programs that use the curriculum materials and approaches developed in the Georgia Research and Development Center in Educational Stimulation.*

The following excerpts from a recent letter from Dr. Schwartz are pertinent to this evaluation:

"In response to your request for a concise evaluation of my postdoctoral fellowship after a lapse of a year and a half, I submit the following. With the passage of time this experience looks more worthwhile to me than it did previously. The portions I appreciate most are:

(1) The opportunity, through independent study, to set one's own goals in research design and to receive aid, as any full time professor on the staff, to accomplish the task developed.

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* Centers in Riverton and Lander, Wyoming; Great Falls, Montana; Gulfport, Mississippi; Pickens County, Georgia; Greenwood, South Carolina

(2) The opportunity to become involved in the field projects in early childhood education because this experience now helps me as I do in-service work and evaluation projects with public schools.

(3) The friendliness and frankness of Dr. Findley and the total R & D staff and being involved as a working member of a team."

5. Recommendations for improving USOE administration of the Educational Research Training Program are limited here to the Postdoctoral Research Training Program, as follows:

(1) As soon as possible, restore the early large-scale design of the program so that it may serve the intended purpose of stimulating postdoctoral programs by systematic support; the present quota of 20 awards nationally doubtless insures that all recipents are of the highest caliber, but the greater need is to establish and facilitate advanced training opportunities necessitated by the rapid development of new specializations in our technological culture.

(2) Until the program can be expanded substantially, provide for as many new awards annually as possible.

(3) Sponsor regional and/or national conference sessions at which prospective postdoctoral students may meet representatives of training institutions over a period of days to better judge what to expect; the present situation loads all such costs on individuals and institutions with low probability of ultimate approval because of the small number of fellowships.

(4) Clarify the scope of opportunity at each institution covered by the fellowship program; many of our applicants appear not to know what programs at the institution are covered. Some USOE publicity evidently makes this explicit, while other publicity apparently does not.

To quote again from Dr. Schwartz's letter:

"Some suggestions I would make are: I wish my experience could have been extended to use the full 12 months period awarded in the fellowship.

That the USOE, or whatever funding agency allow the recipient 3 to 6 months in his own position before having to report for the postdoctoral experience in order to better plan for the experience."

Program Reports

1. Publicity - The program was originally publicized by letters from Dean J. A. Williams, College of Education, University of Georgia, to all Presidents and/or Deans of Colleges of Education in colleges and universities in the Southern Association of Colleges and Schools inviting them to nominate faculty for this opportunity. Most inquiries and applications were secured in this way, but many of our best applicants, including the final recipient of the 1966-67 fellowship, Dr. Schwartz, came from institutions outside of this region reached by USOE publicity.

   The attached materials were prepared for distribution to those inquiring about the Postdoctoral Research Training opportunity. (See Appendix B)

2. Application Summary

   a. Approximate number of inquiries from prospective trainees (letter or conversation) ____15____

   b. Number of complete applications received ____8____

   c. Number of first rank applications (Applicants who are well-qualified whether or not they were offered admission) ____5____

   d. How many applicants were offered admission ____2____

3. Trainee Summary

   a. Number of trainees initially accepted in program ____1____
   Number of trainees enrolled at the beginning of program ____1____
   Number of trainees who completed program ____1____

   b. Categorization of trainees

      (1) Number of trainees who principally are elementary or secondary public school teachers ____0____

      (2) Number of trainees who are principally local public school administrators or supervisors ____0____

      (3) Number of trainees from colleges or universities, junior colleges, research bureaus, etc. (specify)

      ____College____ ____1____
      _____ _____
      _____ _____

4. Program Director's Attendancy

a. What was the number of instructional days for the program? 180**

b. What was the percent of days the director was present? 40%**

5. Financial Summary -- (Note: This summary does not serve as a final financial report so amounts need not be exact.)

	Budgeted	Expended or Committed
a. Trainee Support		
(1) Stipends	10,000	10,000
(2) Dependency Allowance	--	--
(3) Travel	2,000	2,000
b. Direct Costs	--	--
c. Indirect Costs Institutional Allowance	1,000	1,000
TOTAL	13,000	13,000*

* $11,000 received under disbursement arrangements.

** It is estimated that the number of full days Dr. Schwartz devoted to his program, exclusive of Saturdays, was 180. The estimate of project director time "present" is difficult under the informal arrangements that prevailed. The estimate of 40% is based on the number of days on which Dr. Findley was in contact with Dr. Schwartz directly. The proportion of his total time devoted to Dr. Schwartz would be of the order of 5-8%. Other staff contacts would bring the total staff contacts with Dr. Schwartz up to the 40% figure again.

Respectfully submitted,

Warren G. Findley

Warren G. Findley
Principal Investigator

February 27, 1969

APPENDIX A

THE ASSESSMENT OF REPRESENTATIVE SELECTED MATHEMATICAL CONCEPTS OF FIVE YEAR OLD CHILDREN

Dr. Anthony N. Schwartz

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State University of Arts and Science
State University of New York, Plattsburgh

Postdoctoral Fellow
Research and Development Center
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University of Georgia

The development of procedures for the assessment of the capabilities and the measurement of accomplishments of five year olds is a major challenge to the educational world. The Research and Development Center in Educational Stimulation, University of Georgia, has unified its total program of activities around early and continuous intellectual stimulation of children, ages 3 through 12. To carry on such a program requires a sound basis of evaluation for making decisions.

The principal purpose of this research was to develop an instrument which could systematically assess the variations in performance, involving the acquired mathematical concepts and skills of kindergarten children.

BACKGROUND FOR THE STUDY

Neither child growth and development specialists, mathematicians, nor professional educators seem to be in accord as to what mathematical concepts a child has developed at the pre-school level or what the curriculum should encompass at this age. Research has been somewhat limited in scope and the results do not lead one to make conclusive decisions. Opinions differ, some lead one to believe that the child has a very superficial concept of numerosity while others, pertaining to children of a socially biased culture, state that an extensive background of mathematical acumen has been acquired prior to that developed by the organized school program.

The studies of the developmental stages by Piaget (9) serve as a basis for much discussion and argument concerning the mathematical abilities of children, including ages 4 and beyond. Dodwell (2 & 3), Holmes (6), Inhelder (7), Elkind (4) and Wohlwill (12), have done replications of Piagets studies and have tended to support his findings, but in so doing these researchers have had to improve upon the investigative procedures. Research by Estes (5), however, refutes many of the findings mentioned. The author suggests a careful scrutiny of the book by Wallace (10) as an excellent and extensive source of not only the studies mentioned but many others which are very relevant. Although most of these studies indicate some evidences of stages of development, no agreement appears.

Recent studies substantiate the statements that children come to kindergarten with considerable knowledge upon which the school can build an interesting, challenging and sequential curriculum. Studies by Sister Josephina (8) and Brace and Nelson (1) conducted individual evaluations of children. The first studied 30 children in one kindergarten, and the second involved a sampling of 124 children drawn from a population of 3,000. Williams (11) administered a group test to 595 kindergarten entrants and reported a positive response ranging

from 6.9 to 81.3% to the 63 items given.

As far as could be ascertained there are no commercial tests available to specifically measure the cognative mathematical status of children ages 3 to 6 or to evaluate progress as they are intensively subjected to formal instructional procedures.

PURPOSES

The main purpose of this investigation was to develop a group pencil and paper instrument to assess the mathematical achievement of kindergarten children. Secondary concerns were: (a) the assessment of the physical attributes involved in the procedures, such as: turning pages, holding a pencil, and attention span, (b) the assurance that the response of the individual can be accurately recorded, (c) that the response is individual rather than a "cooperative" endeavor.

DEVELOPMENT OF THE INSTRUMENT

In preparation for the development of the SCHWARTZ EARLY MATHEMATICS INVENTORY (SEMI) three primary sources were used to develop concepts and the initial item pool. First, a literature survey was made of material regarding individual or group testing which might have implications for measuring mathematical achievement. Tests, whether general or for specific subject areas, were investigated regarding such areas as: format, manner of presentation, giving directions and recording pupil response. Available materials and workbooks, methodology books, early childhood curricula and general child growth and development releases were also included. A panel of educators reviewed the items.

Second, the author conducted individual assessments of 268 kindergarteners.

Third, kindergarten teachers were interviewed in respect to their number experiences with children.

Since small muscle control must be taken into consideration, it was determined to use but one vertical line in a majority of situations, for responding to each item. Whenever feasible sets were represented by circles and squares so that required vocabulary would be reduced for those with backgrounds of cultural deprivation.

As a result, 81 items were selected having a range from easy to difficult within specific areas. The areas ranged from simple to complex in mathematical learnings which might have probable relevance to this age group. Items were presented in numerous ways to give variety and to ascertain adaptability of Ss.

Pre-inventory exercises of approximately 15 minutes duration were given Ss in order to familiarize them with the social setting, the test carrels and mechanical procedures. Ss were asked to mark with pencil or crayon, whichever was most frequently used in the classroom and were instructed to void any marks they did not want, by making two horizontal marks across the vertical mark they had made. The double line was used to differentiate from an X which many children were prone to use.

SUBJECTS

Completed data was obtained from 215 kindergarteners residing in northern Georgia whose age range was five years zero months to six years five months. Ss attended public and private schools from varied socio-economic, racial and ethnic backgrounds as follows:

a. rural, low socio-economic children were obtained from the total kindergarten enrollment of one county in three schools one of which was Negro. Total N=66.

b. suburban children were obtained by the stratified sampling of the total enrollment of five year olds in a county adjacent to a city of approximately one million population, proportion 9% Negroes. Total N=57.

c. urban, low economic children were obtained from the total enrollment of three schools, selected under a Title I grant as being culturally deprived, in a city of 18,000. Approximately 50% of this group were Negro and were enrolled in one school. Total N=60.

d. urban, high socio-economic culturally advantaged children were obtained from the total enrollment in a private, all white kindergarten. Total N=32.

ADMINISTRATION OF THE SEMI

The Ss were examined during the first three weeks of February in rooms and hallways with which they were familiar, and in their own classrooms if their peers were assigned to carry on activities in another place. Ss were seated six at a table separated by "carrels" of interlocking one-fourth inch plywood one foot high, with a minimum work space of 15" x 32". A maximum of 12 Ss were tested at any one period. Each group of six Ss were supervised by either the administrator, a graduate student or a teacher aide. The tests were administered by graduate students or the author but not by the classroom teacher, although she may have been an observer at an administration. The only assistance given during the time the inventory was being administered was to see that the S was on the correct page or to see that he understood where the response was to be placed.

During the approximately 15 minute pre-inventory exercises, the administrator or the assistant gave any aid required or requested which would help the child in understanding the activities and the task to be accomplished.

The items for the SEMI were read once to the Ss unless the task was somewhat involved or the statement lengthy. The tempo of administering the items was as rapid as feasible to eliminate "peeking", talking and other distracting incidents. The average of two items per minute was suggested as a guide. In order to reduce fatigue, the SEMI was administered on separate days, in three sittings besides the pre-inventory session.

PRESENTATION OF THE DATA

The SEMI booklets were hand scored on a right or wrong basis regardless of the number of foils for the item. No partial credit was allowed. Responses were placed on data cards and computer processed by the TSSA PROGRAM. (13)

INVENTORY STATISTICS

The general test data for the SEMI is presented in Table I as computed from data gathered from 215 kindergarteners. The data indicates that the populations did not fall into the normal curve pattern but are leptokurtic and skewed--a rather common outcome with some kinds of empirical data. The kurtosis is significant at the .05 level. The inventory reliability equals .935 using the Kuder-Richardson Formula 20.

The mean inventory score was 43.19. The scores earned by the Ss ranged from a high of 70 to a low of 8. The later S omitted 54 items. Fifty-two Ss did not omit any items. The range of administration time for the SEMI was: part I, 12-25 minutes; part II, 10-18 minutes; and part III, 12-28 minutes.

ITEM ANALYSIS

An analysis of the 81 items of the SEMI is summarized in Table II. The difficulty level of each item is indicated in terms of the percentage of correct responses. The proportion of Ss selecting a correct response for particular items ranged from .847 to .116. Seven items can be considered comparatively easy as they were answered correctly at least by 80% of the Ss. Eleven items can be considered relatively heard as they were answered correctly by less than 30% of the Ss. No items fell within the extremely easy ($p > .95$) and the extremely difficult ($p < .05$) range.

TABLE I

MEANS, STANDARD DEVIATION, SKEWNESS AND KURTOSIS OF THE SEMI

	Mean	S.E.	Standard Deviation	S.E.	Skewness	S.E.	Kurtosis	S.E.
Raw Score	43.19	1.02	14.97	0.62	-0.42	0.17	-0.53*	0.33

*Significant at .05 level

The point biserial correlation was computed between the proportion passing each item and the total test score. The point biserial gave an index of discrimination ranging from .624 to .106. In item analysis and in assigning items to factors the point biserial scores above .400 were given the most consideration. The results of 49 items fell into this category.

FACTOR ANALYSIS

Although the SEMI was developed as a single score general mathematics inventory, the data was processed for factor analysis by varimax rotation. The number of factors to be extracted was programmed at 10. The resultant loadings ranged from .7701 to .0016. 86.5% of the items had the highest loading in part I. Factor loadings, when rounded to a magnitude of .40 or greater were given greatest emphasis in assigning the items to test parts and sub-parts. The data did not lend itself to 10 discrete factors but was continuous. For example, some items had almost identical values for factors 1-2 and others for factor 2-1. 4.86% of the data extended beyond the scope of the 10 factors programmed. By combining this data with the empirical information of the inventory, the items were categorized into 14 comparatively recognizable and workable parts or sub-parts as given in Table II.

GENERAL OBSERVATIONS

The 8½ x 7 format was adequate for the illustrations and materials presented. Presentation of the items in mimeographed two-dimensional form did not appear to be a barrier to understanding what was expected.

TABLE II

GROUPING AND ANALYSIS OF ITEMS OF THE SEMI

Test Item	Description of item--reflects instructions read to Ss	Per-cent* correct	Point** Biserial Correlation
	PART I PROBLEM SOLVING		
A.	<u>Number stories (If-then situations)</u> Example: While objectifying, "If I have two books and I take one away, then how many will I have left?"		
63.	2-1=n Objects model. Mark the right frame	81	51
64.	5-2=n Objects model. Mark the frame	70	49
65.	1+1=n No objects. Make right number of marks	60	37
61.	2+1=n Objects model. Mark the frame	60	41
62.	3+3=n Objects model. Mark the frame	58	44
67.	2-1=n No objects. Make right number of marks	55	35
68.	5-1=n No objects. Make right number of marks	47	54
66.	2+2=n No objects. Make right number of marks	47	51
B.	<u>Reproduction</u>		
43.	Make 2 marks	79	45
44.	Make 5 marks	68	45
57.	Make the same no. of marks as circles (2)	61	51
59.	Make one less mark than circles (2)	52	21
51.	Make marks for combining a frame with a set of 1 circle with a frame with a set of 2 circles	42	45
58.	Make 2 more marks than circles (2 circles)	20	37
60.	Make 2 more marks than circles (2 circles)	20	33

PART II VISUAL DISCRIMINATION

A.	**Matching and Analyzing Shapes**		
13.	Mark two numbers or figures that are the same	82	53
14.	Mark two numbers/figures that are the same	78	62
28.	Mark something that measures table/how tall you are	66	46
27.	Mark something that measures days of month	62	42
55.	Mark the two shapes that look alike	74	54
56.	Mark two figures that look alike turned the same	39	42
B.	**Recognition of sub-sets**		
9.	Mark frame that has 3 squares	81	50
41.	Mark 3 of the squares in the frame	77	48
52.	Two frames, if one more than other mark it. If same number of circles in both frames mark each frame	75	48
10.	Mark frame that has 5 squares	75	47
42.	Mark 4 of the circles in the frame	73	58
34.	Mark ½ set of 4 squares (scored two ways)	51	37
C.	**Analyzing patterns or classification**		
16.	Frame of sticks or heavy lines, mark the stick that doesn't fit	78	39
15.	Frame of circles, mark the circle that doesn't fit	74	44
7.	Four frames, mark the two frames that have the same number (3 squares)	59	65
1.	Four frames, mark each of the two frames that look the same (four pictures ducks)	54	60

C. (continued)

8.	Four frames, mark the two frames that have the same number (9 circles)	53	61
11.	Frame alternate circles-squares as beads, mark circle or square which will make look right	51	31
12.	Frame, sq., two circles, sq. etc. as beads, mark circle or square which added looks right	50	45

PART III COMPARISON

A. Semi-concrete non-equivalent sets

5.	Mark the largest dog	85	37
6.	Mark the shortest pencil	84	40
2.	Which frame has more buttons?	82	44
35.	Draw a line from dot to dot (dots 7 in. apart)	80	44
3.	Which frame has the most pictures?	77	45

B. Abstract non-equivalent sets

20.	Mark frame with set greater than 3	73	38
23.	Frame has more sq. than circles, mark extra squares	55	29
22.	Mark frame with set equal to 3	41	24
4.	Which frame has the least number of circles?	36	40
21.	Mark frame with set less than 3	36	39
24.	Frame has more squares than circles, mark extra squares	24	26

C. Ordinality

17.	Point to left. Mark the first duck.	84	45
18.	Mark the last duck.	67	58
19.	Mark the third duck.	37	42

PART IV GEOMETRIC IDENTIFICATION

39.	Mark each circle in the frame	54	49
36.	Set blocks or things, mark each wich is all black	41	62
40.	Mark each triangle	35	36
37.	Mark each block/thing which has some black and some white	28	49
38.	Set different shapes, mark those with more than two sides	14	33

PART V SPATIAL JUDGEMENT

53.	Pictures two pieces string, one tight, one loose. Mark the string which you think is longer.	49	20
69.	Two jars same size. Water put in other jar, how high?	46	38
70.	Two jars, one ½ dia. other, mark height water other jar.	34	11
45.	Seriation-sets of lines, make marks missing set (3)	26	35
46.	Seriation-sets of lines, make marks missing set (4)	21	30
54.	Bar graph, fill in or mark to look right	14	29

PART VI TIME IDENTIFICATION

26.	Four frames clocks/watches, mark six o'clock	49	49
25.	Four frames clocks/watches, mark tweleve o'clock	45	36
29.	Clock face, made two hands show 6 o'clock	35	42

PART VII NUMERAL-NUMBER CONCEPTS

Ss confronted with numerals 0 through 10 for following items:

71.	Mark the number for 3	73	47
72.	Mark number for 6	64	52
74.	Mark number that shows number fingers one hand (4 or 5)	64	52
73.	Mark number that shows how many eyes you have	63	51
76.	Mark the number that comes just before 5	52	53
75.	Mark the number which shows you don't have any	47	46
77.	Mark the number that comes just after 7	45	43
78.	Mark the number that comes two numbers before 4	41	27
79.	Mark the number that comes two numbers after 3	32	22
80.	When I count 5, 4, 3, 2; mark number I should say next	29	38
81.	When I count 10, 9, 8, 7; mark number I should say next	29	37

PART VII MONEY IDENTIFICATION

48.	Mark the frame that shows a dime	71	24
49.	Mark the frame . . . which of 4 coins will buy the most (3¢ and nickel)	68	33
50.	Mark which will buy the most (2 frames)	56	14
47.	Mark the frame that shows a nickel	54	13

PART IX FRACTIONAL RECOGNITION

32.	Mark the jar that is ½ full of water	41	38
30.	Mark the frame that shows ¼ or one-quarter pie	35	17
31.	Mark the frame that shows 1/3 of a pie	24	14
33.	Mark the jar that is ¼ full of water	12	01

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*Percent correct is computed including errors and omits

**Point biserial correlation is correlation of item with total test score

TABLE III

ITEMS CONSIDERED COMPARATIVELY HARD--PROPORTION OF Ss ANSWERING CORRECTLY $\leq$ 30

24.	Frame has more squares than circles, mark extra squares	.24
31.	Mark the frame that shows 1/3 of a pie	.24
33.	Mark the jar that is ¼ full of water	.12
37.	Mark each block/thing which has some black and some white	.28
38.	Set different shapes, mark those with more than two sides	.14
45.	Seriation--sets of lines, make marks (3) for missing set	.26
46.	Seriation--sets of lines, make marks (4) for missing set	.21
54.	Bar graph, fill in or mark to look right	.14
58.	Make 2 more marks than circles (2 circles)	.20
80.	When I count 5,4,3,2. Mark number I should say next	.29
81.	When I count 10, 9, 8, 7. Mark number I should say next	.29

The response to most items was usually immediate and the answer readily designated. Instructions were easily remembered and very little repetition was necessary. The means developed for voiding responses proved invaluable and highly suitable for this age group.

SUMMARY AND GENERALIZATIONS

An instrument, the SCHWARTZ EARLY MATHEMATICS INVENTORY (SEMI), was devised to assess, by means of group administration, the mathematical achievement of children ages 3 through 5. This data concerns only the first stages of the process and deals only with five-year olds.

A reliability of .935 was obtained on the 81 items administered. The mean for items correct was 43.2. The proportion of correct responses for various items ranged from .847 to .116.

The Ss had satisfactorilyacquired the physical and emotional attributes necessary for completing the inventory, namely, holding a pencil or crayon, turning pages, recording responses in designated areas, and maintaining satisfactory attention for the 12 to 28 minutes required for administering each of the three portions of the SEMI. By using portable carrels and the usual kindergarten tables, a very high degree of individual response was maintained.

This data is encouraging in light of the purposes of the investigation. Further refining and decreasing the number of items should make for a more usable instrument. Since the youngest children taking the SEMI were able to perform the physical functions necessary the author is encouraged to validate the instrument for three and four year olds.

FOOTNOTES

1. The research reported herein was performed as a special project as a portion of the postdoctoral education training program sponsored as part of the activities of the Research and Development Center in Educational Stimulation at the University of Georgia pursuant to a contract with the U.S. Department of Health, Education and Welfare grant No. OREG 2-6-061881-1406.

2. A complete copy of the SCHWARTZ EARLY MATHEMATICS INVENTORY and related materials are on file at the Research and Development Center in Educational Stimulation, University of Georgia.

3. Grateful acknowledgement is made to Dr. Warren G. Findley and staff of the Research and Development Center in Educational Stimulation, for the assistance offered in conjunction with the postdoctoral training program.

4. Numeral- numberconnotations are used interchangeably because of usage by children, parents and some teachers.

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APPENDIX B

University of Georgia
Athens, Georgia

Postdoctoral Research Training Program
in Educational Stimulation (Ages 3-12)

Summary

Trainees will bring themselves up to date by guided reading in early childhood education in the areas of research studies, research design, evaluation technique, computer programing, curriculum innovation, school organization and staffing, learning theory, child development, urban and rural sociology, and compensatory intervention for disadvantaged children. Each trainee will be assigned to the director or one of the associate directors of the Research and Development Center in Educational Stimulation, who will guide his reading and supervise his participation in ongoing research or field testing in the schools of nearby districts. It is expected that each trainee will produce a substantial, publishable monograph or the equivalent in several shorter ones. In exceptional cases, it may be possible to meet the postdoctoral student's needs by scheduling him into regular advanced graduate courses for some of his work, but it is expected that guided reading, direct observation, and participation as a staff member in conducting research, developing curriculum materials, field testing innovative procedures and/or materials, or the development of evaluative technique will add most to predoctoral training.

PROPOSAL FOR POSTDOCTORAL RESEARCH TRAINING PROGRAM
IN EDUCATIONAL STIMULATION (AGES 3-12)

1. Type of Program - The proposed program is for a twelve-month postdoctoral research training program in the area of educational stimulation for children ages 3 through 12. The duration of the postdoctoral program is for five years beginning September 1, 1966 and ending August 31, 1971. The first group of four trainees will begin September 1, 1966 and terminate August 31, 1967. The twelve-month training periods for the remaining four years will follow the same schedule.

2. Significance of the Training Program to Education - There is an acute shortage of personnel trained in research on the intellectual development of young children. Yet all signs point to rapid expansion of programs to promote the intellectual development of children even earlier than age six where compulsory school attendance and state support of instructional costs begins in most of the United States today. Project Head Start in the summer of 1965 was the harbinger of further efforts to be made in compensatory education for disadvantaged children; for some time private schools have offered nursery school and kindergarten to parents able and willing to support early educational stimulation of their children and are increasingly accepting this responsibility. In addition, the educational demands of our modern technological society require that we attempt to teach in the elementary school more of the substantive knowledge previously taught in high school to make room for the explosion of knowledge it is now necessary to teach in high school and college. In all instances, the increased instructional tempo must provide systematic, continuous programs of educational stimulation compatible with each other if the total impact is to be cumulative and efficient.

Research is needed as the basis for planning and evaluation of earlier educational stimulation. It is significant that under Title I of Public Law 89-10, the first suggested project is "Evaluation of Programs Developed under Title I of Public Law 89-10". The suggestion proceeds to propose "evaluative teams" of trained specialists to report to local school superintendents. Such personnel, unfortunately, are available at present on only a small scale and in our largest school systems. The current study of early teaching of reading in the Denver schools is an example of the extensive, systematic planning and evaluation, based on research training, that is essential if proposed innovations in early educational stimulation are to be properly attested for functional effectiveness in operational school situations before widespread adoption.

Research and evaluation at early age levels (ages 3 through 12) require a special blend of understanding child psychology, skill in developing relevant instruction methods and materials, and proficiency in research technique, including the development of procedures to obtain performance data from children too young to respond to the more formal tests and devices appropriate for older children, who can read and write fluently and otherwise cooperate in providing objective evidence of their progress. Persons possessing experience with young children must be helped to acquire research skills not generally expected of kindergarten and elementary teachers in the past, at the same time that others familiar with research technique applicable to older age levels are helped to understand, promote and measure intellectual development in young children.

The University of Georgia is in a unique position to train such people at the postdoctoral level. Its graduate training program in 1965 produced 34 Ed.D.'s and 42 Ph.D.'s. The Research and Development Center in Educational Stimulation, supported by the U. S. Office of Education, has an ongoing program of basic and applied research, evaluation, curriculum development and field testing, and dissemination under a full-time or major-time professional staff of 14, supplemented by 27 part-time staff from the colleges of education, arts and sciences, home economics, and social work. The basic hypothesis that unifies the whole program of activities of this Research and Development Center is that early and continuous intellectual stimulation of children, ages 3 through 12, through structured sequential learning activities will result in higher levels of ultimate achievement than would otherwise be attained. Furthermore, the plan of action of the Center implies projection downward of successful practices. Thus, all work will be conducted with the intent not only of improvement at the level studied, but of exploring the possibility of offering similar experiences, with appropriate modification, to younger children.* Postdoctoral trainees can be attached as junior staff members to individual major professional staff members of the Research and Development Center to learn the techniques of research and evaluation by participating in the conduct of such research. A program of guided reading and observation under a major professional staff

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*See attached statement describing the goals and operations of the Research and Development Center in Educational Stimulation for a full account of the Center's potential for supporting postdoctoral training.

member, supplementing the research activity, will be supported by faculty resources of a major graduate institution and the strongest computer capability in the Southeast, all in the context of as close collaboration between a state university, a state education department, and the school people of a state as is to be found anywhere in the United States.

3. The Objectives of the Training Program - The general objective may be stated as: to help postdoctoral trainees acquire research competence relevant to the design and evaluation of innovative programs for the educational stimulation of children, ages 3 through 12. More specifically, the training program's objectives are:

   (1) To acquaint trainees with the problem areas in providing "early and continuous intellectual stimulation of children, ages 3 through 12, through structured sequential learning activities."

   (2) To familiarize trainees with children's behavioral reactions at the transition point presented by introduction to school and during early schooling.

   (3) To teach trainees research design, with particular reference to early educational stimulation, including how to delimit a problem.

   (4) To help trainees master the intricacies of developing instructional and/or evaluative techniques and procedures appropriate to individuals who can neither read nor write or are in early stages of developing those skills.

   (5) To help trainees learn techniques of involving and guiding others in research projects.

   (6) To guide trainees in the development of the skills of presenting results of research in a form suitable for professional meetings and journals.

   (7) To help trainees acquire skill in presenting results to teachers, administrators, parents, and the more general public, including demonstrations as well as talks.

4. Number and Selection of Participants - It is proposed that four new trainees be selected each fall for the five-year duration. Four trainees are proposed as a manageable complement. Each of the four senior staff members from the Research and Development Center listed on the proposal (Director, Associate Director for Research, Associate Director for Evaluation, Associate Director

for Development and Field Testing) can properly direct the work of one trainee in conjunction with performance of his other duties. It is assumed that trainees and directors will find the relationship symbiotic in that mutual interest in a common research activity will mean training for one and mature collaboration for the other.

Selection will be after application. Factors to be considered in selection: relevance of published research such as the doctoral dissertation, letters of recommendation, record in graduate school, test scores on the Graduage Record Examination Aptitude Test and Advanced Tests in Education, Psychology, and/or Mathematics, and a written statement of a plan of study. Recruiting efforts will be directed both at those just finishing the doctorate in related fields who are not yet committed to a field of research or teaching, and at those experienced in kindergarten-primary teaching or teacher preparation who need more technical training. In keeping with a belief that respectable male figures are needed to achieve a masculine-feminine balance in early childhood experiences of children, a slight preference may well be given male over female candidates. Nation-wide appeal will be made, there will be no effort to concentrate on local needs even though there may be more applicants from Georgia and nearby states.

Final selection will be made by the four senior staff members listed on the proposal acting as a committee of the whole. The fact of assignment of the four selected to the four staff members in a one-to-one working relationship, however, will require that each staff member is personally satisfied with the postdoctoral trainee assigned to work with him. Of course, the trainee's plan of study must be consonant with the basic hypothesis of the Center, in that it must have to do with educational stimulation of children, ages 3 through 12. Promise of future productivity of a candidate will, nevertheless, tend to outweigh the special immediate interests of the corresponding senior professor in a narrowly specific area of research. Without prescribing a detailed selection procedure - an impossibility, really - we may say that published research, recommendations of predoctoral major professors and advisors and the proposed plan of study will loom large in comparison with statistical evidence in the form of test scores or course grades in the final selection.

5. Educational Research Training Capability - Aside from the evidence they provide of certified competence to conduct research, the following related projects give scope for training and experience of the four trainees per year in the

Postdoctoral Research Training Program in Educational Stimulation for Children Ages 3 through 12:

(1) Research and Development Center in Educational Stimulation.

A major project involving full-time professional staff of eleven and majority time of three others, supported by the research time of 25 other professors in the colleges of education, arts and sciences, home economics, and social work. Approximately 36 predoctoral graduate assistants work with this professional staff on half-time appointments.*

Although the Research and Development Center in Educational Stimulation is the organizing focus for the Postdoctoral Training Program, these additional programs and projects are directly relevant:

(2) Curriculum Improvement Project in Written Composition for the Elementary School.

A project supported under Project English for five years beginning in 1963. A central staff of five give one-third time to directing the work of six predoctoral graduate assistants on one-third time, plus the work of teachers at each level from kindergarten or grade one through grade six in 14 cooperating school centers in Georgia and neighboring states.

(3) Curriculum Development Project in Anthropology in Elementary School.

A project supported under Project Social Studies for five years beginning in 1964. A central staff of seven give one-third time to directing the work of eight predoctoral graduate assistants on one-third time, plus the work of teachers at each level from grade one through grade seven in 17 cooperating school centers in Georgia and neighboring states.

(4) Curriculum Improvement Project in Reading in the Primary Grades.

A Cooperative Research Project under the general provisions of Public Law 531. A central staff of three give one-third time to directing the teaching, testing, and statistical analysis of results in reading from primary grade classes in three school systems where methods and materials have been adapted to slow, average, and superior learners.

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*See attached statement of goals and operations of the Research and Development Center for a fuller statement of this research training capability.

(5) Predoctoral Training Program in Research Design in Education.

An NDEA training program in which two or three new trainees each year are supported in a program designed to train them for college teaching of methods of educational research. The program is jointly sponsored by the College of Education and the Department of Statistics in the College of Arts and Sciences.

In addition, a teacher education project, several smaller, but still substantial research projects in reading and in mathematics education in the elementary school are in continuous operation and development.

Assignment to a particular professor in the Research and Development Center in Educational Stimulation gives a focus to the Postdoctoral Training Program, but the other research projects provide added avenues of specialized concentratio

Enrollment and degrees. In Fall 1965 there were 1,356 resident graduate students; 381 were enrolled in Ph.D. programs and 87 in Ed.D. programs. For the last six years, the graduate enrollment has grown double the rate of undergraduate enrollment. The University is becoming primarily a senior devision and a graduate institution. Doctoral registrations have increased ninefold since 1959 - from 58 to 468. Doctoral degrees awarded have increased sevenfold since 1959 - from 11 to 76.

Ph.D. and Ed.D. Programs. The University now offers the Ph.D. degree in thirty-two different programs. In Fall 1965, 381 Ph.D. candidates were registered in 29 different programs. The University offers the Ed. D. degree in eighteen programs. Programs for secondary, elementary, and college research and teaching permit specialization analogous to Ph.D. programs, under cooperative arrangement with faculties in other schools and colleges, particularly the College of Arts and Sciences. The 87 doctoral students enrolled in the Graduate School through the College of Education in Fall 1965 were enrolled in 14 different programs.

University Research Capability. In Fall 1965 the budgeted research faculty numbers 295 persons. The total amount budgeted in 1964-1965 for General Research, exclusive of agriculture, in state and restricted funds, was slightly over four million dollars. University research productivity in 1964-1965 was 359 published articles, 236 articles in press, and 268 papers presented at professional meetings

Graduate Faculty. Membership in the Graduate Faculty of the University is based on a record of published research, nomination by the department head and dean of the college, and appointment by the President. In the last five

years, the Graduate Faculty has increased from 103 to 264 appointed members. Average compensation for faculty members of all ranks has increased nearly thirty per cent during the last three years. This salary increase has placed the University of Georgia in a position to recruit and retain outstanding faculty members with research interests and abilities.

Research Capability, College of Education.

Research Funds. The combined research, service, and teaching budgets of the College of Education for FY 1965-1966 totals $2,441,215. Of this amount, 39 per cent - $952,539 - is budgeted for research. The amount of time released for research but not actually budgeted raises the percentage allocated to research to about 50 per cent of total expenditures.

Faculty Engaged in Research. Thirty-nine per cent of the equivalent full-time faculty of the College of Education - equals 74 11/12 full-time faculty - have budgeted or released time for research, as shown in the following table.

Source	Number	EQF
University Research & Grants	47	26 1/12
Bureau Ed. Studies	16	5
Vocational Education	9	5
Research Assts., Grants	84	38 5/6
TOTAL		74 11/12
Per Cent of Total EQF		39.0

Training Level of College of Education Faculty. Of the 130 faculty members in Fall 1965, 110 were full-time in professional education. Of this number, 80 per cent hold the doctorate.

Except for four staff members, all faculty engaging in research, in budgeted or released time positions, hold the doctorate.

Faculty Productivity. In FY 1964-1965, the faculty of the College of Education published 100 research and other articles.

6. Program Outline - The general approach will be to involve the trainees in direct participation in all phases of designing and conducting research studies in the Research and Development Center in Educational Stimulation.* The specific

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*See attached statement of goals and operations of the Research and Development Center in Educational Stimulation for detailed evidence of ways the Center can facilitate postdoctoral training.

procedures described below are related point by point to the objectives listed earlier (Section 3). Because postdoctoral trainees bring a large, but varied body of previously acquired skills and experiences, the program outlined below is not a "course" through which all trainees will pass, step by step, in mastering the same skills. Rather, each postdoctoral trainee will work directly with his major professor in designing, conducting and publishing (jointly or separately) a research study, in the process of which he will achieve as much under each of the objectives as his past background requires and his long-term professional goals dictate.

The specific elements of the program outline are as follows:

(1) Trainees will have access to the products of twelve* "problem specification projects" conducted under the auspices of the Research and Development Center in Educational Stimulation by major professors aided by teams of graduate assistants. These products include not only bibliographies and critiques of current publications and programs, but an effort to synthesize the findings and indicate points where research is needed relevant to the basic hypothesis of the Center. This resource will be enhanced by products of the Educational Research Information Center (ERIC) with which we anticipate active collaboration. The basic documents, produced by the problem specification projects and ERIC, can and will be furnished for study between appointment and arrival on campus. Trainees will also have access to seminars at which invited specialists will address staff and predoctoral candidates in all of the programs described in Section 5, including the Research and Development Center in Educational Stimulation.

(2) Direct observation of children's behavior at school entrance and in early schooling will be provided in the planning aspects of the research activity undertaken. Active working arrangements with local school systems in Georgia assure opportunity for pilot or trial activities preliminary to launching the trainee's major research activity. Participation as an observer in studies now in process at these levels will

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*The twelve areas are not mutually exclusive, but the focus of each may be indicated as follows: reading, writing, listening, speaking, mathematics, social studies, science, fine arts, physical education, child development, educational organization and administration, and evaluative technique.

help those whose previous backgrounds have involved research at other age levels.

(3) Active collaboration with the major professor in designing the trainee's research study will provide direct as well as incidental instruction in research design, as needed. Where the research study calls for advanced or specialized technique, the trainee will have access through his major professor to the staff of the Department of Statistics and statistical specialists in other departments in a graduate faculty of 264. This work will involve learning the procedures for organizing data for computer treatment; for most this will include learning how to program data for statistical analysis by the computer.

A special limitation of the necessarily brief twelve-month post-doctoral training program is that it does not permit the trainee to participate in the full sweep of longitudinal research, so basic to exploration and evaluation of the effects of innovation in early educational stimulation. This experience will be provided vicariously in association with persons in the Research and Development Center working on longitudinal studies and through seminars involving Center staff and visiting consultants on the problems of ongoing longitudinal research studies.

(4) Special attention will be devoted to development and validation of evaluative devices appropriate to young children. Instructional materials and methods will also involve special problems related to reading and writing, but the crucial problem will be evaluation. The present staffs in home economics (nursery education) and elementary education and the evaluation elements in the composition, anthropology and reading projects (See Section 5) will be drawn upon for much expertise. Special staff strength is being recruited in language development and child psychology and extensive use will be made of consultants expert in that realm. It is only fair to say, however, that this specialized area of evaluation has been so seriously neglected in the past as to constitute a necessary point of major frontal attack in the program.

(5) Experience in involving and guiding others in research projects is a planned feature of the research study. The trainee will participate in negotiations arranging for the study in a local school system, will

maintain contact during the study, giving appropriate guidance and instructions to cooperating school personnel, and will have responsibility for directing graduate assistants and other clerical personnel in the correspondence and statistical activities at the Center. This last will involve guiding the processing of the data of the study through the Computer Center at the University of Georgia.

(6) Each trainee will be expected to prepare a first draft of the study report for publication in a professional journal. Depending on the nature and scope of the study, this may be an individual article or a joint product with the major professor and/or others. Guidance by the major professor in mastering the skills of presentation will be incidental to the preparation of the report.

(7) An important, but often neglected skill is that of presenting the results of a research study to school personnel and the public as the basis for understanding the significance of negative findings or as the basis for adopting and applying positive findings. So far as possible and desired, this type of learning experience will be provided through the dissemination function of the Research and Development Center.

Advanced courses in measurement, research, learning theory, child development will be offered each year and may prove efficient means of organizing study of deficient areas for some postdoctoral trainees. Generally, the ability to take a desired course at the moment it is needed will be difficult to accomplish, so the basic strength outside the major professor will be in the form of consultations, rather than courses.

7. Facilities

Computer Center. The University Computer Center operates with a 32K IBM 7094 with 12 tape drives, a 16K IBM 1401 with four tape drives, a 8K IBM 1401 with two tape drives, a 60K IBM 1620 and a full complement of unit record equipment. The staff now provides statistical consulting and computer service for a wide range of research projects.

An IBM 360, now on order, will be linked with several remote stations, including the medical colleges in Georgia and South Carolina, a medical center in Mississippi, and various department offices.

On completion of the new Graduate Studies Research Center, the Computer Center will be relocated.

New Facilities.

Graduate Studies Research Center. A new Graduate Studies Research Center to be erected adjacent to the $15,000,000 Science Center, will begin early in 1966 at a cost of $6,100,000. It will house a special science library with 300,000 volume capacity, 300 student carrels, and provide a seating capacity of 1,200. It will house the Computer Center, office of the Dean of the Graduate School, Office of Vice President for Research and Office of General Research, Social Science Research Institute, Bureau of Economics, and other research focused on interdisciplinary cooperation. The new building will also provide expanded facilities for the Departments of Mathematics, Statistics, and Biochemistry.

Library. Library holdings now include more than 650,000 volumes, about one million manuscripts, 150,000 maps, and about 214,000 microfilms. There are 5,050 separate journal subscriptions. About $400,000 is budgeted for new library acquisitions in 1965-1966.

Library holdings in the Education (L) classification number about 27,000 volumes.

8. Related Support

NDEA Fellowships. Subvention funds from NDEA Title IV fellowships are used for improvement of library holdings (in addition to the regular library budget), support of additional research, and first-year and summer support.

Institutes. In Summer 1965, eleven NSF and NDEA institutes budgeted at $544,693 provided graduate training for 425 students. Seven academic year institutes for 1965-1966 in the amount of $684,882 provided support for 110 resident students and 580 in-service students.